Section 10 Sevier River Basin
AGRICULTURAL WATER

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Agricultural Water

Agriculture is the backbone of the Sevier River Basin economy.

10.1 INTRODUCTION

This section describes the agricultural resources in the Sevier River Basin. It also describes the problems, needs and future of agriculture.

The success of agriculture is dependent on the climate, soils and water supply in each locality but it can only aspire to what each farmer and rancher wants for the future. Agriculture is the major industry; as such, it has a direct impact on the economy of the area. Spinoffs from agriculture help support employment and production in other sectors along with providing economic diversity.

10.2 BACKGROUND

The irrigated land was estimated at 2,520 acres in 1850 and had increased to about 100,000 acres by 1870. By 1884, only 14 years later, the irrigated cropland area had doubled to 200,000 acres. By the turn of the century, an additional 100,000 acres was under irrigation and by 1920, the total irrigated area was 350,000 acres. An inventory of the irrigated cropland during the 1980s showed there were 381,090 acres.[20] However, a Division of Water Resources land-use survey conducted during the early 1990s show 354,320 acres of irrigated cropland.[21] The water budgets[16] and projected agricultural water use are based on the 1985 inventory. A water budget was not prepared based on the data of the 1990s.

Large increases in irrigated lands came between 1869-80; 112,300 acres in 11 years. 1902 saw the biggest single- year increase of 77,000 acres The increase in irrigated land gradually slowed until it was controlled by the available water supply. Fluctuations in streamflows are indicated by the increase or decrease in the acres of idle and/or fallowed cropland.

These changes in water supply are less pronounced in Pahvant Valley where pumped water is a larger proportion of the total supply. During the drier years, more water is pumped from groundwater to supply the total crop demand. Conversely, less water is pumped during the wetter years.

Fluctuations in cropland irrigated in the Levan area are less than on the Sevier River but larger than Pahvant Valley. This reflects the volume of groundwater pumped in relation to surface water use.

There are many tracts of arable land where crops could be cultivated if there were a dependable water supply. Some areas are restricted because of topography, others because of lands such as national parks and monuments and state parks. Nearly the entire basin is suitable for grazing by livestock and wildlife.

Typically, irrigated cropland is in the valley bottoms where the land is relatively flat. Much of the non-irrigated dry cropland areas is located where there is arable land with sufficient precipitation. Rangeland is found from the low-lying desert areas to the high-mountain forests.

The number of farms has decreased by about one-third over the years.[65] This has been accompanied by an increase in average farm size from about 200 acres in 1924 to about 750 acres in 1964. This included all uses such as irrigated and dry cropland and rangeland. In 1992, the average farm size varied from 390 acres for Sevier County to 790 acres in Millard County and 1,640 acres in Juab County. This reflects the need for more acreage to maintain a viable operation. An increase in the number of part-time farmers may offset this trend. There may be a continual adjustment as existing irrigated cropland is converted to other uses. Water for agriculture is limited and restricts increases in the irrigated cropland acreage.

Beef cattle production is currently the largest farm-related industry, primarily consisting of cow-calf operations along with feedlots. Most of the crops grown are used to support these activities along with pasture and rangelands.

There are several large dairy operations that depend on feed and pasture. The turkey industry is important in Sanpete Valley. It depends on feed production from irrigated lands and uses agricultural and culinary water. The mushroom plant near Fillmore distributes produce throughout Utah and Colorado. A large chicken operation is planned northwest of Delta.

10.3 AGRICULTURAL LANDS

Agricultural lands cover a major portion of the Sevier River Basin. These lands are in all kinds of ownership and administration categories: private, state, tribal and federal. All the irrigated croplands are in private ownership while most of the grazing lands are under state, tribal and federal administration.

10.3.1 Irrigated Croplands

The irrigated acreage stabilized at just under 350,000 by 1920. Irrigation water use followed the same trends. Irrigated areas are shown on Figure 10-1. Most of the crop current production is used to support the livestock industry, although some alfalfa is shipped out of the area, primarily to Nevada, California and Japan. Most of the exported alfalfa is from the Delta area.

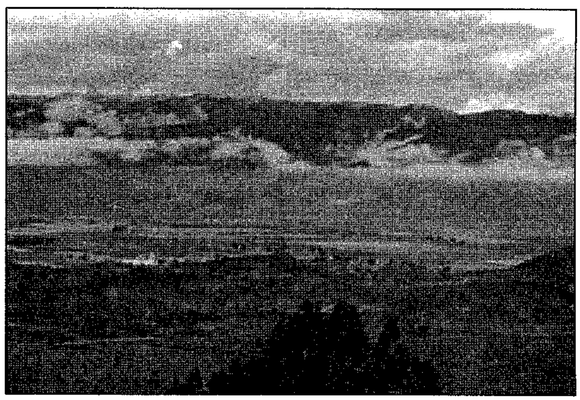
Irrigation water use has remained relatively stable over the past 50 years, fluctuating only with the wet and dry cycles. The effects of the short-term cycles are dampened somewhat by the extensive surface-water storage facilities. Groundwater pumping in Pahvant Valley and Levan tend to reduce the impact of dry years.

The extent of irrigated cropland is reflected in the water use. An average of about 903,460 acre-feet of the total water supply is diverted for irrigation of croplands. It is estimated 783,000 acre-feet comes from surface water and 120,460 acre-feet is pumped from groundwater. This use is based on the 1980s land use surveys, water budgets based on the period 1951-80 and several studies by the U.S. Geological Survey during the 1960s, 1980s and 1990s. Irrigation water use is shown on Table 10-l. For definitions of diversion, depletion and consumptive use see Appendix A.

There has been no significant change in the total basin-wide acreage of irrigated cropland for the last 50 years except for the cropland taken out of production when the Intermountain Power Project purchased water rights in the Delta area for their operation. A study was conducted by the Soil Conservation Service during the early 1960s to determine the irrigated cropland acreages. The Division of Water Resources contracted for land-use surveys in the early 1980s for the upper, middle and lower portions of the Sevier River Basin. The division again conducted land-use surveys in the early 1990s using aerial photography with field checks to delineate the cropland areas. Most of the differences in acreage determined by these surveys can be attributed to methodology used and definition of croplands. The inventories show irrigated acreages at that point in time. Each survey will vary as methodology improves. Also, they are not intended to show the irrigated lands as described in Bacon's Bible or used in the Cox Decree.

The most recent survey (1995) by the Division of Water Resources is the most accurate. This land-use survey inventoried the cropland by various categories of land use. The irrigated cropland inventory included idle and fallow lands as these usually are included in the crop rotation patterns. The total irrigated cropland area in 1995 was 354,320 acres. The major crops include alfalfa, 40 percent; small grains, 13 percent; pasture and grass hay, 14 percent; and idle and fallow, 12 percent. The pasture and grass hay include surface and subirrigated cropland.

Changes in cropland acreage came about by various reasons. Part of the idle land is now in the



Irrigated Cropland in Sevier Valley

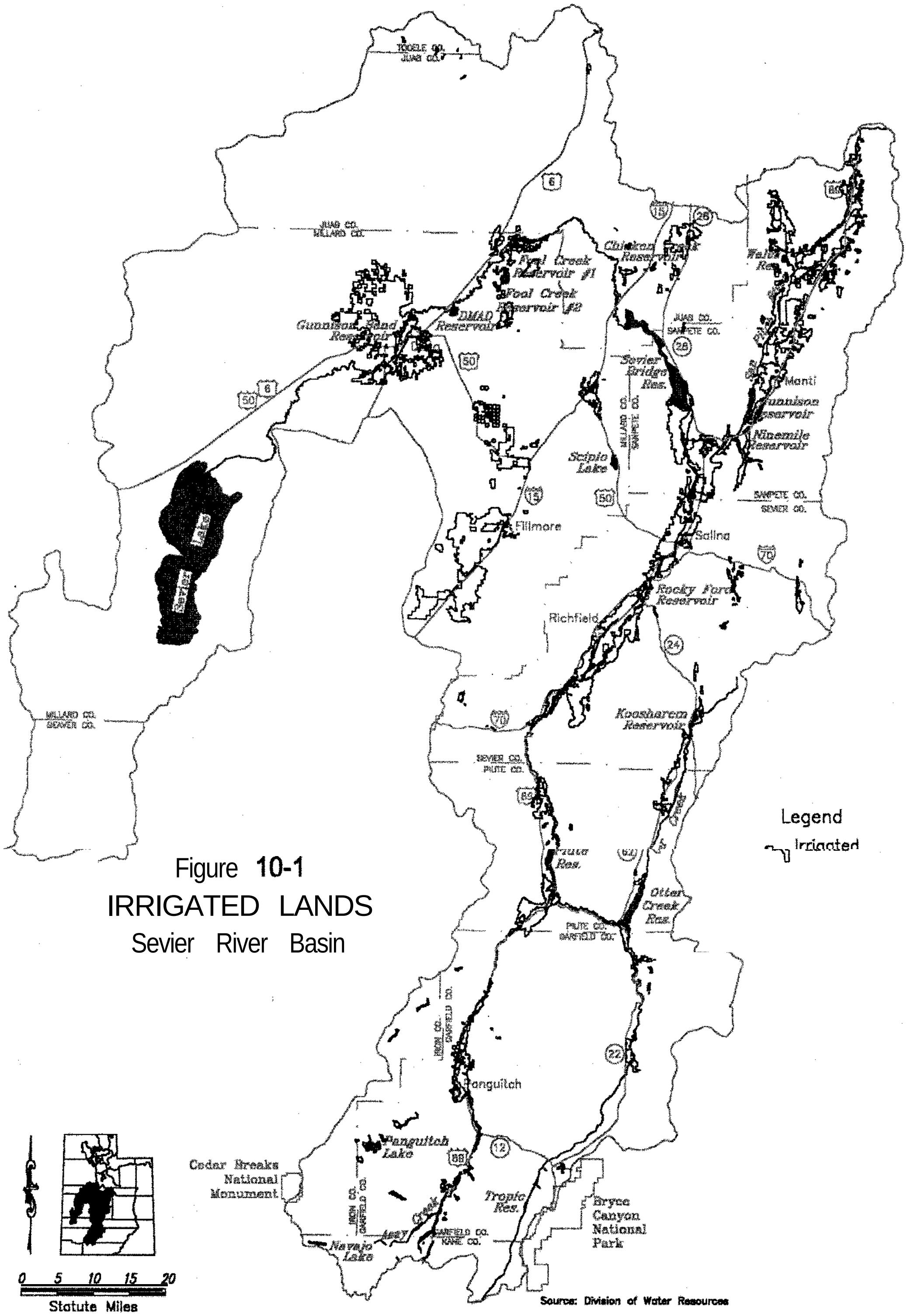


Figure **10-1**
IRRIGATED LANDS
Sevier River Basin

Table 10-1
IRRIGATION WATER USE AND DEPLETION

Subbasin	Area (acres)	Diversion (acre-feet)	Depletion (acre-feet)
Upper Sevier	15,200	60,720	13,960
East Fork	17,540	24,800	20,530
Junction-Marysvale	14,680	57,410	28,340
Richfield	4 1,260	121,870	50,640
Gunnison	52,940	151,950	58,850
San Pitch	83,740	167,080	116,990
Scipio/Levan	34,800	36,900	30,940
Delta	69,510	139,970	125,520
Pahvant Valley	51,430	142,760	81,810
Total	381,100	903,460	527,580

Source: Land-use surveys, 1981-85 and water budgets, 1991 Division of Water Resources

Changes in cropland acreage came about by various reasons. Part of the idle land is now in the USDA Conservation Reserve Program. The interstate highway construction had a minor impact primarily in the Pahvant Valley. The Intermountain Power Project had a greater impact locally as irrigated land was retired when water rights were purchased for operation of the plant. Better inventory methods changed some acreages. The irrigated land by crop is shown in Table 10-2. This shows irrigated land inventoried in the 1990s. The irrigated land by crop is also shown on Figure 10-2.

Lands used for farming can be defined according to their agricultural production ability and potential. The Natural Resources Conservation Service uses two major categories to define the best farmlands: prime farmlands and farmlands of statewide importance. The national definition has been modified for application to the state of Utah. There are about 144,600 acres of prime farmlands used for agriculture in the basin. The acreage of farmlands of statewide importance was not estimated.

Irrigation of cropland in the Delta area is carried out using water high in total dissolved solids on soils with a large fraction of clay. By the time upstream flows reach Sevier Bridge Reservoir, the total dissolved solids (TDS) are upwards of 1,500 mg/L. This water is made up of high-sodium summer return flows and low-sodium winter flows.

In dry years, the inflow water quality is much lower than during wet years. As the water moves downstream, the salt load increases until the TDS are about 2,500 mg/L near Hinckley. Beyond this point, the water often reaches 3,000 mg/L.

The crops and soils in the Delta area have adapted somewhat to the chemical constituents through intense cultural practices and management. This included drilling deep wells to provide higher quality water; leveling cropland and lining canals to increase conveyance and irrigation efficiencies to help lower the water table; and establishing a realistic leaching program which includes deep scarifying, using humus to control sodium, applying irrigation water for leaching and constructing drains to carry away the excess water.

10.3.2 Dry Cropiand

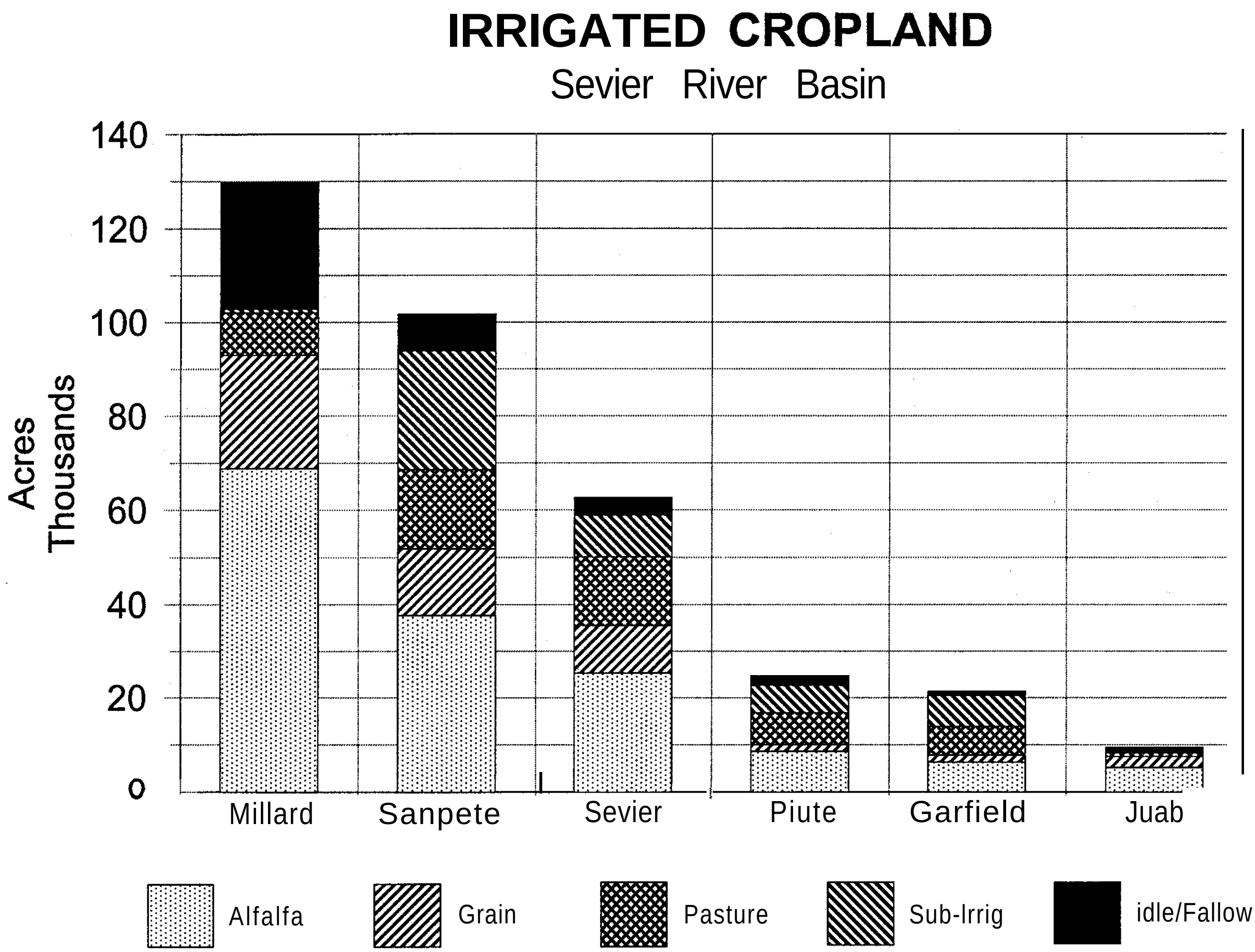
There are 40,400 acres of dry cropland. Of this amount, 95 percent is in Millard County and most of the balance is in Juab County.[63, 64] Minor areas of dry cropland are also in Sanpete Valley. About 55 percent of the total dry cropland is either idle, fallow or not cropped for other reasons on any given year. Many of these idle acres are in the Conservation Reserve Program, a federal program designed to reduce soil loss and bolster the grain price.

Table 10-2
SUMMARY OF LAND COVER BY COUNTY
(1993 and 1995)

Cover	Iron	Piute	Garfield	Kane	Sevier	Sanpete	Millard	Juab	Tooele	Total
Surface Irrigated Cropland						(acres)				
Orchard	0	0	0	0	20	10	40	0	0	70
Grain	0	1,550	1,530	0	5,860	12,370	21,310	2,400	0	45,020
Corn	0	40	20	0	4,440	2,040	2,790	100	0	9,430
Row Crops	0	0	0	0	10	30	1,240	0	0	1,280
Alfalfa	0	6,660	4,990	0	23,420	31,610	68,470	5,060	0	140,210
Grass/Hay	0	1,910	1,370	0	1,940	5,960	460	60	0	11,700
Pasture	30	6,810	6,070	110	14,600	16,560	9,130	570	200	54,080
Grass/Turf	0	0	0	0	170	10	0	230	0	410
Idle Plowed	0	390	250	0	910	1,100	3,210	490	0	6,350
Idle Overgrown	0	1,660	600	0	2,710	6,660	23,900	790	0	36.320
Pasture (Surf & Sub)	440	5,230	6,320	230	8,250	8,910	180	130	0	29,690
Grass/Hay (Surf & Sub)	0	0	0	0	0	2,140	0	50	0	2,190
Subtotal	470	24,250	21,150	340	62,330	87,400	130,730	9,880	200	336,750
Sub-Irrigated Cropland										
Sub-irrigated Pasture	70	420	290	200	480	14,200	370	1,380	0	17,410
Sub-irrigated Grass/Hay	0	0	0	0	0	160	0	0	0	160
Subtotal	70	420	290	200	480	14,360	370	1,380	0	17,570
Total Irrigated Croplands	540	24,670	21,440	540	62,810	101,760	131,100	11,260	200	354,320

Source: Division of Water Resources. Water-Related Land Use Inventories. Sevier River Basin. 1996

Figure 1 O-2


IRRIGATED CROPLAND
Sevier River Basin
Acres
Thousands
140
120
100
80
60
40
20
0
Millard
Sanpete
Sevier
Piute
Garfield
Juab
Alfalfa
Grain
Pasture
Sub-Irrig
idle/Fallow

Some of the dry cropland areas produce grasses for livestock grazing. These grasses are both native and exotic varieties. Only about 8,000 acres of dry cropland are used for small grain production. There are small acreages of dry cropland alfalfa production but only one crop is harvested for hay. There may be some use as pasture.

10.3.3 Rangelands

Rangelands comprise the largest segment of agricultural land with just over five million acres or 75 percent of the total basin area. Some of this land is forested, but is also grazed by livestock and/or wildlife. Large areas of grazing land are located in the western part of the basin. These areas are used for winter grazing.

Winter grazing areas have also been bought by the Division of Wildlife Resources to protect land frequented by deer. These areas tend to run along the foothills between the irrigated areas and forested lands. Other lands are used by waterfowl and the three state fish hatcheries. These areas cover a total of 48,790 acres.

Permitted grazing on public lands declined after the 1940s, but since then has remained fairly stable. Many grazing permits have changed from sheep to cattle. As rangeland conditions improve, grazing permits should be restored where vegetation has been stabilized.

There has been considerable work done in localized areas to increase livestock and wildlife forage on rangelands with practices such as chaining pinyon-juniper and brush, and reseeding with grass. Management practices have been improved. Forage production varies greatly between types of vegetation, range condition, and good and bad years. Range in fair condition produces 50 to 80 percent as much forage as range in good condition. Variations in range conditions from good to bad years can reduce forage production by 40 to 70 percent.

There are between 600,000 and 650,000 animal unit months (AUMs) of grazing produced. These are supported by base property in the irrigated cropland areas where pasture and winter feed is produced.

There are about 500 cattle and 100 sheep operations, with base property in the Sevier River Basin, that graze on national forest lands. These permittees utilize between 100,000 and 150,000 AUMs. In addition, 300 cattle and 130 sheep operations grazed on lands administered by the Bureau of Land Management where about 350,000 AUMs were utilized. State and private lands provide about 150,000 AUMs.

The Bureau of Land Management has allocated from 30,000 to 40,000 AUMs for wildlife. The Forest Service estimates about 10-15 percent of the AUMs allocated are utilized by wildlife. The cattle/sheep and wildlife ratios should be maintained to protect the viability of the livestock operations.

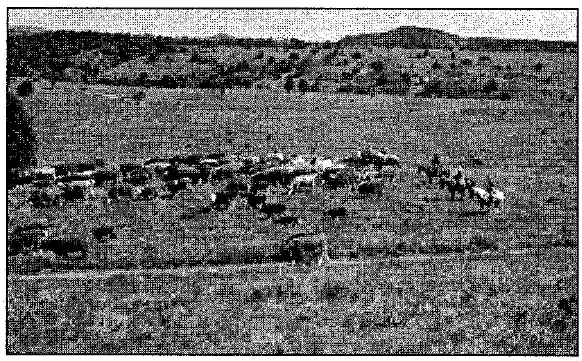
10.3.4 Watershed Management

Watershed management is the protection, conservation and use of all the natural resources of a drainage area to keep the soil mantle in place and productive and to produce the quality water needed for downstream uses. Poorly managed watersheds are readily damaged from erosion, flooding, sediment and fire.

Following are some of the treatment measures used to keep watersheds viable:

- Livestock and wildlife management
- Vegetation improvement
- Structural measures
- Watering facilities protection
- Controlled burns

Clean Lakes Program improvement projects were implemented in the watershed area to reduce non-point source pollution in Otter Creek Reservoir. Three projects totaling 2,280 acres were spearheaded by the Bureau of Land Management. The project



Cattle on Pahvant Range-Fish Lake National Forest lands are improved through brush control and reseeding using funding from private, state and federal sources.

10.3.5 Other Lands

There were 129,950 acres of other lands inventoried during the land-use survey in 1995.[21] These lands included 92,000 acres of wetlands and open water areas and 37,950 acres of residential and industrial areas. These lands are in the valley bottoms; lands in the foothills and mountain areas were not included.

10.4 AGRICULTURAL WATER PROBLEMS AND NEEDS

Most of the water problems are related to irrigation water use and management since agriculture is the largest user. Other problems include watershed erosion and sediment production.

Weed control is a problem throughout the valley agricultural lands as well as in the upper watershed areas. Thistle control is a particular problem.

10.4.1 Irrigation Water Problems

Water quality in some of the groundwater reservoirs is deteriorating. Most of the contamination is coming from deep percolation of irrigation water and leaching from geologic formations. This water is leaching salts out of the soils and into the groundwater. This is a problem in the irrigated areas upstream from Sevier Bridge Reservoir and in Pahvant Valley. However, there are many examples of well-managed farm operations in all of these areas where deep percolation and the resulting pollution of groundwater are lower.

The Sevier Desert area is unique. In this area, leaching of salts from the crop root zone is necessary to assure continued crop production. After considerable trial and error, the water table, salt balance and leaching requirements are now in critical balance so crop production can be maintained or increased.

A major irrigation water problem is low efficiency in both conveyance and on-farm irrigation systems. Over-irrigation also leaches saline contaminants into the groundwater.

Use of the Sevier River is based on inefficiency. Return flows from inefficient use upstream is generally a downstream water right. This is particularly true along the Sevier River mainstem where there are geologic restrictions between groundwater basins. For example, more efficient use in Panguitch Valley may not change the volume in downstream flows if there is a reduction in the amount of water diverted and the acreage irrigated remains the same. There would be a change in timing as the flows not diverted are immediately available where return flows from irrigation takes longer to reach the river. A change in timing could impact some water rights. However, return flow timing is further modified by downstream storage reservoirs. If late summer shortages were supplemented by improved efficiencies, there would be some increased use resulting in less return flows.

In off main-stem areas such as Chalk Creek, Meadow Creek and Corn Creek in Pahvant Valley or Chicken and Pigeon creeks near Levan, increased water use would decrease recharge to the groundwater. In addition, improved overall delivery and application efficiencies, would reduce deep percolation to the groundwater reservoirs. To compensate, the diversions could be reduced allowing more water to flow to the natural recharge areas. However, as increased acreage cannot be brought under irrigation, the only incentive to the farmer would be labor savings and increased crop production through more efficient water application.

There are water shortages from time to time throughout the Sevier River Basin. Water-budget data indicates there is an average annual shortage of nearly 7,500 acre-feet to fulfill crop potential consumptive use needs. This would require a diversion of 12,930 acre-feet. At present, the acreage of irrigated cropland increases or decreases from year to year depending on the available water supply.

10.4.2 Erosion

Any improper practice using land beyond its capabilities contributes to erosion. Examples are improper road and trail location and changes in natural stream regimen. The increased use of 4-wheel drive vehicles, ORVs and motorcycles leave tracks that can develop into small gullies and increase erosion. Land administering agencies should increase the control of watershed abuse by the recreating public. The effect of accelerated wind erosion is spectacular in-the Little Sahara area. Several thousand acres are covered by sand dunes not unlike some vast desert. This phenomenon has been turned into a popular recreation area.

There are more than 200,000 acres of geologic erosion, nearly 1 ,OOO,OOO acres of heavy to excessive erosion and 1 ,OOO,OOO acres of moderate erosion. Areas of heavy to excessive and geologic erosion are shown on Figure 10-3. These two erosion classifications are described as follows.

Heavy to excessive erosion Gully systems are well developed with active small gullies. Sheet erosion and hummocking is extreme, root systems of shrubs and trees may be exposed. Plant cover, often annuals, is low in the successional stages and often has no stabilizing influence on the soil. There is little or no humus present.

Geologic erosion Erosion is a result of climatological and geological factors. Scattered plants usually exist but large areas of bare soil are exposed. Soils often lack a distinctive "A" or top horizon.

Erosion conditions were mapped from information in the National Forest Range Allotment Analysis surveys and Bureau of Land Management Range Condition surveys and data developed during the USDA investigations on the Sevier River Basin in the 1960s.

Although range condition has improved, the principal cause of accelerated erosion is still over-grazing by domestic livestock and overpopulation of wildlife. Grazing reached its peak between 1875 and 1910. This depleted the vegetation to the extent accelerated erosion became a dominant feature in some areas, contributing to extreme flooding and mud-rock flows. Since then, grazing has been reduced and better management practices have been implemented. Vegetation manipulation and reseeding practices have improved the watersheds resulting in reduced erosion.

Transmountain and transwatershed diversions have created erosion problems in several areas. These include transmountain diversions conveying water from the Colorado River drainage to the San Pitch River drainage and diversion of Castle Creek to Panguitch Lake.

10.4.3 Sedimentation

Sediment damage falls into two major categories: (1) Spectacular cloudburst flood sediments, and (2) insidious sedimentation with perennial stream flows. Costs can be large from either type of sedimentation. The highest sedimentation rates are in the following five drainages.[63] Rates are given in acre-feet per square mile of drainage area. These are: (1) 4.20, Ephraim Creek; (2) 1.90, Pleasant Creek near Mt. Pleasant; (3) 1.70, Cottonwood Creek near Richfield; (4) 1 .10, Sand and "H" Canyons near Monroe; and (5) 0.72, Flat Canyon near Elsinore.

Sediment records were collected for the Sevier River at Hatch for 1992 to 1995. Based on this data, the sedimentation rate was 0.03 acre-feet per square mile. This rate shows sedimentation in the headwater of the Sevier River is very low.

Sediment damages to irrigation facilities occur in three forms. First, deposits in diversion structures and canals from the water supply. This requires continuous clean out and is more serious in areas above major reservoirs and on tributary streams. Second, deposits from floodwater intercepted by canals. This requires sediment removal unless the flood flows can be bypassed. Third, deposits on irrigated lands, especially in those areas irrigated with water not regulated by storage reservoirs. Sediment deposition requires periodic releveling of cropland to maintain irrigation efficiencies. Conversion to sprinkler systems and the accompanying sediment removal facilities can eliminate this problem.

Sediment deposition rates were determined for Otter Creek, Piute and Sevier Bridge Reservoirs.[63] These rates were based on surveys of the three reservoirs in 1962-63 and on the original surveys conducted between 1926 and 1941. Sediment accumulations were determined and the annual storage capacity loss was calculated.

The average annual storage capacity loss was as follows: Otter Creek Reservoir, 0.110 percent; Piute Reservoir, 0.173 percent; and Sevier Bridge Reservoir, 0.051 percent. At this rate, all three reservoirs will last more than 500 years. A total of about 8,000 acre-feet of sediment has been deposited

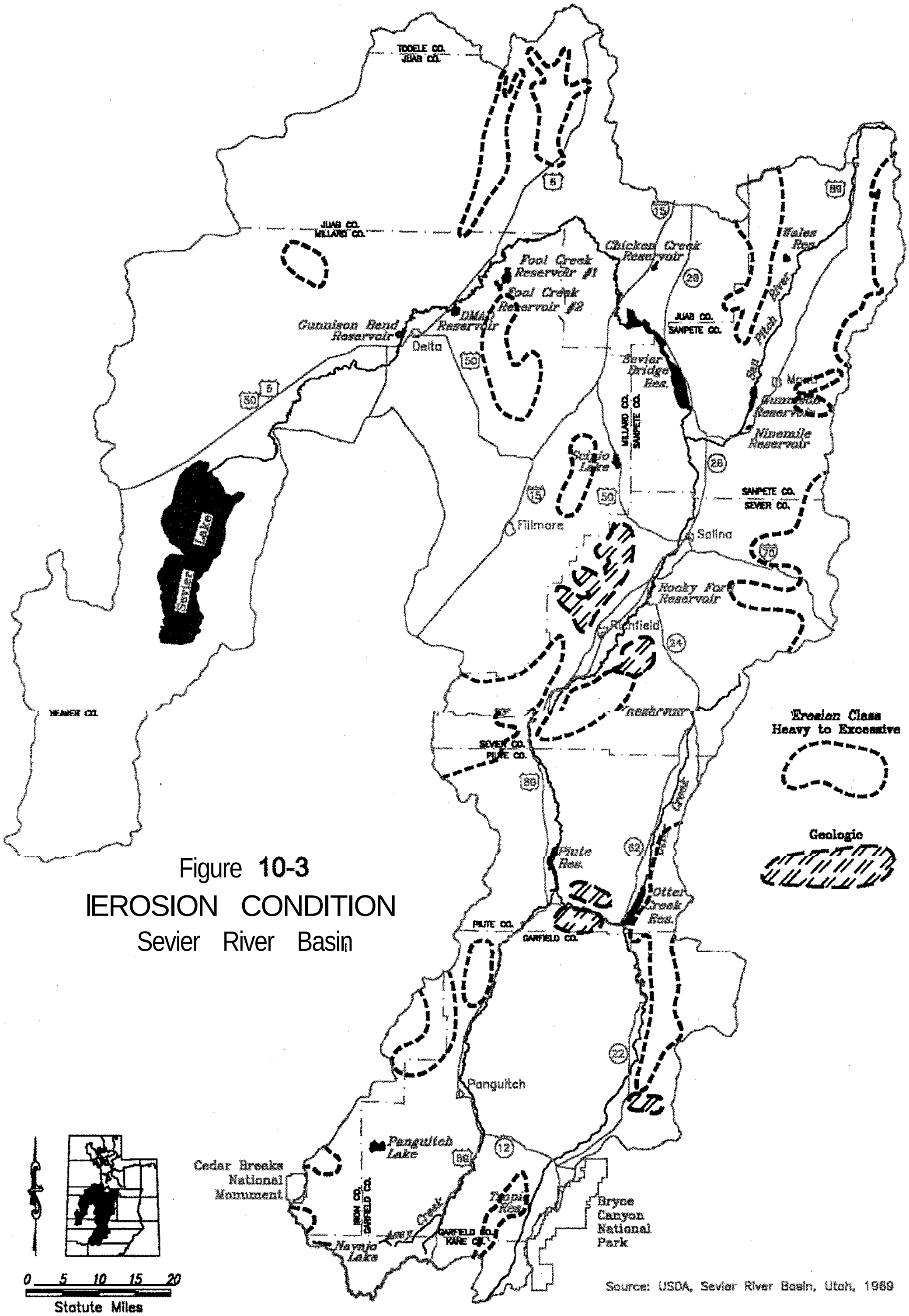


Figure 10-3
EROSION CONDITION
Sevier River Basin

in these reservoirs. This is not the total volume of sediment transported into the reservoir area as there are large volumes of sediment entrapped immediately above the reservoirs. The sediment deposition rate could not be established for Gunnison Reservoir since no previous survey had been made to determine capacity. However, an original survey was completed in 1964 to determine the area-capacity relationships.

10.5 CONSERVATION AND DEVELOPMENT ALTERNATIVES

The only possibility for additional water from outside the basin is the potential Narrows (Gooseberry) Project. Since there is no water available from the Central Utah Project, the only other option is to make additional water available within the basin. This can come from three sources: better management of the surface water supplies, increased utilization of the groundwater reservoirs and maximizing the cloud-seeding program.

Improvement of water use efficiency is one way to realize additional monetary benefits from an existing supply. Delivery systems can be upgraded by lining high seepage areas in canals with concrete or plastic lining and by installing pipelines. Improving or rebuilding diversion structures and effective measurement and management controls can also increase efficient use of water. This could include use of real-time stream gauging station data.[45] See the issue on real-time monitoring and control systems in Section 6.5.1.

Real-time instrumentation on canal diversions is being used in the Delta and Richfield areas. Results are up to expectations so far with water savings more than 10 percent. This approach could be a valuable tool in other areas.

On-farm irrigation efficiency improvements are a way to reduce the increasing contamination of the groundwater reservoirs. If water is applied more efficiently, less will be used and the deep percolation to groundwater will be reduced. This will decrease the volume of total dissolved solids removed from the soils and conveyed into the groundwater. Over-irrigation is common throughout the basin.

The best way to reduce accelerated erosion is to establish a healthy watershed. If there are a variety of grasses and forbes along with brush in the lower elevations and a mixture of conifers and aspen along with grasses in the higher elevations, erosion will be drastically reduced. This will require an intensive rehabilitation program along with intensive management livestock and wildlife grazing. With reduced erosion, there will be less sedimentation.

Along this same line, recent studies by the Forest Service have indicated increases in runoff can be achieved if upper watershed vegetation can be managed.[8,9,10] However, this will require more research. Studies to date indicate water yield can be increased if aspen dominated stands exist rather than mixed conifer with some aspen. For every 1,000 acres of forest lands converted from conifer to aspen, annual water gain can be 250-500 acre-feet. In addition, there is a potential gain of 500 to 1,000 pounds of undergrowth, most of which is forage. This could lead to a gain in numbers and kinds of plants and animals.

Not only does this increase the downstream water supply and forage for livestock and wildlife, it also provides sites for recreational opportunities, wood fiber, landscape diversity and esthetics. The loss of these benefits has come from the successional process, reduction of wildfire which has allowed dense conifer stands, and long-term overuse by cattle and wildlife. There are several, although often controversial, alternatives to reduce replacement of aspen stands by conifers, sagebrush or tall shrubs. These include fire, harvesting, spraying, ripping and chaining.

10.6 ISSUES AND RECOMMENDATIONS

There is one issue. It is the need for a study of range practices.

10.6.1 Rangeland Erosion Study

Issue - A study of rangeland condition is needed to determine potential erosion reduction practices.

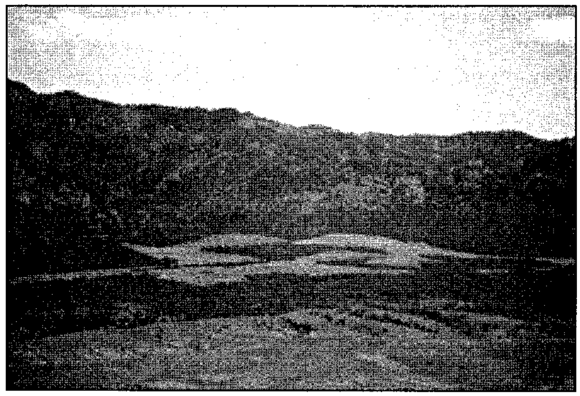
Discussion - All land has a natural productivity potential and a natural rate of erosion based on undisturbed conditions. An inventory is needed to determine the present condition of the land, what future condition can be expected and the treatment alternatives to improve the productivity and reduce erosion.

Basic information is provided by hydrologic, agronomic, soils and economic analyses in order to make intelligent choices among the alternative treatments to alleviate the problems. This basic information comes from the present condition inventory.

Watersheds yielding the highest volumes of sediment should be prioritized. These watersheds should be inventoried by order of priority to evaluate the present condition and to determine the structural and non-structural measures needed to control erosion, sediment yield and floods. These measures include land treatment, structures and land management.

Urban lands make up part of the watershed. In urban areas, soil and land use information are needed to identify areas most suited for urban development and poorly suited for agriculture. This will allow planners to guide urban expansion and protect good agricultural areas from encroachment.

Recommendation - The Division of Water Quality in cooperation with the local Soil Conservation Districts should take the lead in identifying high priority watersheds needing treatment. The Department of Agriculture and other state and federal agencies should assist as requested.



Rangeland vegetation improvement